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**Bureau of Waste Prevention
Division of Consumer and Transportation Programs**

**310 CMR 7.40:
THE MASSACHUSETTS
LOW EMISSION VEHICLE PROGRAM**

**Background Document and Technical Support for Public Hearings on
the Proposed Amendments to the
State Implementation Plan for Ozone; and
Public Hearing and Findings Under the
Massachusetts Low Emission Vehicle Statute**

**Regulatory Authority: Massachusetts General Laws, Chapter 111,
Sections 142A through 142M**

September 2005

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD Service - 1-800-298-2207.

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APPENDICES

- Appendix A.* Chapter 410 of the Acts of 1990 and M.G.L., Chapter 111, Section 142K;
Appendix B. Text of Amendments to 310 CMR 7.40;
Appendix C.* Proposed Title 13 California Code of Regulations (CCR) 1961.1, Greenhouse Gas Exhaust Emission Standards and Test Procedures - 2009 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium Duty Vehicles, including all supporting documents and information available as of the California Air Resources Board's May 11, 2005 publication of its "Second Notice of Availability".

* These documents are available for public review at the Department of Environmental Protection, One Winter Street, 2nd Floor, Boston, Massachusetts.
Note: Appendix C documents are available for public review via the internet at www.arb.ca.gov/regact/grnhsgas/grnhsgas.htm

Background Document and Technical Support For Public Hearing:
**To Consider Amendments to Adopt the California Greenhouse Gas
Exhaust Emission Standards and Test Procedures for 2009 and
Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-
Duty Vehicles**

310 CMR 7.40: The Massachusetts Low Emission Vehicle Program

August 2005

The proposed amendments to the Massachusetts Low Emission Vehicle (LEV) program incorporate modifications made by California to its LEV program. The proposed amendments include the adoption of Greenhouse Gas (GHG) fleet average emission standards for passenger cars, light-duty trucks, and medium duty vehicles, as well as GHG credit and banking provisions.

I. INTRODUCTION

The federal Clean Air Act (CAA) allows states to adopt California motor vehicle emission standards which are more stringent than the federal motor vehicle emission standards if the standards are identical to California standards and are adopted at least two years before the start of the model year to which the standards apply. The Department is proposing to adopt the California GHG requirements in 2005 which will be effective for MY 2009, thus providing the two year lead time required by Section 177. Under M.G.L. c.111, Sections 142B and 142K, the Department is required to adopt California emission standards unless the standards will not achieve greater emission reductions, in the aggregate, than federal emission standards. Since there are no federal motor vehicle GHG emission standards, California's standards are clearly more stringent.

The Department first promulgated the LEV regulations in Massachusetts in 1991. These regulations adopted the California motor vehicle emissions standards, including the mandate for zero emission vehicles (ZEVs). The Massachusetts LEV regulation has been modified numerous times to reflect revisions to the California program.

In 2004, Massachusetts Governor Romney announced the Massachusetts Climate Protection Plan,¹ which laid out a coordinated state-wide response to reduce GHG emissions and protect the climate, focusing on strategies across the energy, building, transportation and natural resource sectors. One of the vehicle-related actions committed to in the Plan was the implementation of stronger vehicle emission standards, specifically,

Massachusetts will adopt GHG emissions standards for new light-duty vehicles. Under Section 177 of the Clean Air Act, work will begin as soon as California finalizes its standards. Starting immediately, the Commonwealth will undertake the necessary work to facilitate adoption of the new California standards as soon as they are adopted. In addition, the Commonwealth will work cooperatively with New York, Vermont, Maine, New Jersey, Connecticut, and other

¹ Massachusetts Climate Protection Plan, 2004, www.mass.gov/Eocd/docs/pdfs/fullcolorclimateplan.pdf

states to implement these rules and to seek regional approaches to reduce GHGs from the regional vehicle fleet wherever feasible.²

The rationale for addressing the transportation sector was explained in the 2004 Plan:

By adhering to California's stringent emissions standards, [Massachusetts has] had enormous success in reducing conventional pollutants such as hydrocarbons and nitrogen oxides in cars sold in the Commonwealth. However, stringent as those standards have been, they have not regulated greenhouse gas emissions, and the growing number of vehicles on Massachusetts' roads...has contributed to a significant growth in carbon emissions.

By any measure, whether it is vehicle miles traveled (VMT), average fuel efficiency, or overall use of transportation energy, greenhouse gas emissions from the transportation sector are growing rapidly. The Center for Clean Air Policy projects that, if we fail to take action, transportation CO₂ emissions in the Commonwealth will be 33% higher in 2020 than in base year 1990.

Slowing the growth of emissions in the transportation sector is critically important, and it presents one of the most significant challenges to overall climate change mitigation efforts.³

Adoption of California's GHG vehicle emission standards is an important step in the Commonwealth's coordinated effort to reduce GHG emissions and address climate change.

II. BACKGROUND

The Federal Clean Air Act Provisions

Section 209(b) of the Clean Air Act allows the State of California to adopt its own motor vehicle emissions standards if the U.S. Environmental Protection Agency (EPA) grants a waiver for the standards. According to section 209(b), EPA must approve a waiver proposal if it finds that the California standard "...will be, in the aggregate, at least as protective of public health and welfare as applicable Federal standards."

Section 177 of the CAA authorizes states to adopt and enforce California's motor vehicle emission standards, which are more stringent than federal emission standards. Section 177 also mandates that states electing this option must adopt standards that are identical to California's at least two years before the commencement of the model year to which the standards will apply.

Massachusetts Law

In 1990, the Massachusetts Legislature enacted Chapter 410 of the Acts of 1990, which is codified at M.G.L. c. 111, Section 142K. This law mandates that the Department adopt and implement California motor vehicle emission standards

"unless, after a public hearing, the Department establishes, based on substantial evidence, that said emission standards and a compliance program similar to the state of California's will not achieve, in the aggregate, greater motor vehicle pollution reductions than the federal standards and compliance program for any such model year."

² Massachusetts Climate Protection Plan, page 41

³ Massachusetts Climate Protection Plan, page 40

Chapter 410 of the Acts of 1990 and M.G.L. c. 111, Section 142K are included as Appendix A.

History of the Massachusetts LEV Program

In 1991, the Department promulgated 310 CMR 7.40, the LEV Program regulation. This regulation adopted the California LEV program and the LEV I emissions standards for all passenger cars (PC) and Light Duty Trucks (LDT) up to 6,000 pounds gross vehicle weight rating (GVWR) delivered for sale in Massachusetts, effective with Model Year (MY) 1995 vehicles. The Department also adopted California's Zero Emission Vehicle (ZEV) requirements, which called for progressively more zero emission vehicles to be sold beginning in MY 1998.

The Department has amended the LEV regulation to adopt the fleet-wide emission average for non-methane organic gases (NMOG), the next generation of California emission standards known as "LEV II", the LEV I & II emission standards for medium-duty vehicles (including diesel vehicles and engines), revisions to the ZEV regulations, and California's "Not-to-Exceed" (NTE) emission standards and test procedures for heavy-duty diesel engines (HDDE) and vehicles.

The most recent amendments to the LEV regulations occurred in 2004 when the Department adopted California's 2003 changes to the ZEV rules. As part of that process, the Department determined that changes to the ZEV Alternative Compliance Plan (ACP) option were needed in order for it to be more effective; such changes have been proposed and the Department anticipates that amendments to implement those changes will be finalized by late summer.

III. CLIMATE CHANGE AND GREENHOUSE GASES (GHGs)

The scientific background and motivations for regulating emissions of GHGs were described in the 2004 Massachusetts Climate Protection Plan. That background and possible Massachusetts climate change impacts are repeated below from the 2004 Plan.

Climate change refers to unstable weather patterns caused by increases in the average global temperature. There is a consensus among climate scientists that these changes result from atmospheric concentrations of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and other heat-trapping gases. These greenhouse gases form a blanket of pollution that stays in the atmosphere and may be the fundamental cause of climate instability characterized by severe weather events such as storms, droughts, floods, heat waves, and sea level rise.⁴

Atmospheric concentrations of carbon dioxide are the highest they have been in 140,000 years, with concentrations going from 290 parts per million (ppm) in 1870 to 373 ppm today. A consensus of climate change scientists agrees that the increasing concentrations of GHGs are causing a rise in average global temperatures. Whether or not this rise in temperature is fully human-induced, temperature records are being broken frequently. For example, 2003 was the third warmest year on record, following 2002, while 1998 remains the warmest year ever recorded. The Inter[overnment]al Panel [on] Climate Change (IPCC), a group sponsored by the United Nations and the World Meteorological Organization, representing more than 2,000 leading climate scientists, predicts an average temperature increase of 5-9°F by 2100, although a wider range of outcomes is possible. To put this number in perspective, only about 9°F separates

⁴ Massachusetts Climate Protection Plan, 2004, Page 5

the world at the beginning of the twenty-first century from the world at the end of the last Ice Age, more than 10,000 years ago.⁵

What Could be the Impacts of Climate Change on Massachusetts?

We are concerned about climate change worldwide because, if it continues, it will bring significant humanitarian, environmental and economic impacts globally. While there is some scientific uncertainty as to the magnitude of these potential changes, there is broad agreement that such change would affect many aspects of our daily lives.

There would also be impacts within the Commonwealth. For example, the New England Regional Assessment (NERA) predicts that if climate trends continue as projected, the weather patterns in Boston at the end of this century would look more like those now found in Richmond, Virginia or Atlanta, Georgia. Climate change on this scale would have wide-ranging consequences for the Commonwealth.⁶

Categories of potential impacts resulting from climate change are detailed in the 2004 Plan as follows:⁷

WEATHER EVENTS: Weather extremes, already a characteristic of New England, are likely to become more frequent and cause more damage under a changing climate. While no one storm is directly attributable to climate change, an increasing number of such events could become more commonplace, severely interrupting Bay State life and economic activity. For example, downed power lines, overburdened septic systems, and travel delays are all costs that would have to be borne by our citizens.

COASTAL IMPACTS: Massachusetts and all coastal states would lose beachfront in the coming years as climate change causes rising sea levels and stronger coastal storms. By 2100, a 5-9°F increase in global temperatures is forecast to double the rate of sea-level rise from 11 inches over the last century to 22 inches in this century.

ECONOMIC IMPACTS: Climate change would have impacts on important Massachusetts industries such as tourism and agriculture, which rely on the strength and vitality of our natural resources.

WATER RESOURCES: Higher temperatures would accelerate evaporation and cause drier conditions and droughts, placing pressure on our water resources, which are already stressed by regional growth. Water shortages would, in turn, alter the natural fish populations in our rivers, streams, lakes, and ponds, and saltwater could intrude in our coastal fresh water supplies.

FISH AND OCEAN IMPACTS: A warmer, saltier ocean and changing coastal currents would alter coastal and marine ecosystems, affecting the distribution, growth rate, and survival of our commercial fish, shellfish, and lobster stocks.

HUMAN HEALTH AND COMFORT: While CO₂ itself is non-toxic, its warming effects cause hotter weather with more frequent and severe heat waves, posing multiple health risks that include a rise in heat-related illness, more frequent periods of harmful outdoor air quality, and the spread of certain diseases.

NATURAL RESOURCES: Climate change could have serious impacts on the state's diverse ecosystems and native species, and may encourage the spread of non-native species. It would also likely alter the natural range of many different plants and animals. Over the long term, warming could intensify droughts and damage forest ecosystems.

⁵ Massachusetts Climate Protection Plan, 2004, Pages 5-6

⁶ Massachusetts Climate Protection Plan, 2004, Page 6

⁷ Massachusetts Climate Protection Plan, 2004, Pages 6-7

The Department detailed additional human health impacts associated with climate change in the supporting documentation for MA's first regulation of GHG, from power plants.⁸ The human health impacts were summarized as follows:

Human Health

Climate change is expected to have wide-ranging and mostly adverse impacts on human health, with a significant loss of life, including:

- *Increases in mortality and illness due to increases in the intensity and duration of heat waves.*
- *Increases in the potential transmission of vector-borne infectious diseases (due to extensions in geographic range and seasons for vector organisms) such as malaria, dengue, encephalitis, and yellow fever.*
- *Increases in non-vector borne diseases (such as salmonellosis, cholera, and giardiasis) due to elevated temperatures and increased flooding.*
- *Additional health consequences from limitations on fresh water supplies, nutritious food, and the aggravation of air pollution.*

IV. SUMMARY OF THE PROPOSED AMENDMENTS TO 310 CMR 7.40

The proposed amendments include vehicle fleet GHG emissions standards for most (except exemptions discussed below) vehicles with loaded vehicle weights (LVW) up to 10,000 pounds, a phase-in schedule beginning with MY 2009 vehicles (including adjustments for smaller manufacturers), provisions for rewarding credit for early introduction of vehicles which meet the standards, and alternative compliance options which provide flexibility to the manufacturers in complying with the requirements.

The proposed amendments in Table 1 of 310 CMR 7.40(1)(c). include the designation "TBD" (to be determined) in place of a "Section Amended Date" for California's proposed GHG rules (Title 13 Section 1961.1). The designation "TBD" will be replaced in the final regulation with the date on which California's Title 13 Section 1961.1 is made final and becomes a matter of law in California. The Department expects that the California GHG rules will be finalized and become law in California by December 2005, following which, the Department will publish the final Massachusetts regulations adopting California's standards by the end of 2005.

The proposed amendments also include clarifying amendments which were inadvertently omitted in past revisions to the LEV regulation. The clarifying amendments are associated with the optional certification and testing of medium-duty vehicle engines to the heavy-duty engine standards and test procedures set forth in California's Title 13, Section 1956.8. In order to maintain consistency with California's Title 13 Section 1961, the Department proposes to incorporate the clarifying amendments into sections (1)(b), (2)(a), (3)(a), (3)(c), (3)(d), and (5)(c) of 310 CMR 7.40.

GHG Emission Standards

The proposed GHG emission standards are identical to those proposed by the California Air Resources Board (CARB). In keeping with CARB's requirements, the proposed standards consist of two

⁸ "Statement of Reasons and Response to Comments For 310 CMR 7.00 et seq.: 310 CMR 7.29 - Emission Standards For Power Plants," April 2001, at <http://www.mass.gov/dep/bwp/daqc/files/regs/finalrsn.doc>

separate standards. One standard is for vehicles with LVW up to 3,750 pounds (i.e., passenger cars (PC) and light duty trucks (LDT1)), and one is for heavier trucks and vehicles (i.e., light duty trucks (LDT2) from 3,751 pounds LVW to 8,500 pounds GVW and medium duty passenger vehicles (MDPV) between 8,500 and 10,000 pounds GVW). Light-duty trucks from 3,751 pounds LVW to 8,500 pounds GVW that are certified to the Option 1 LEV II NOx standard are exempt from these greenhouse gas emission requirements. Further, the proposed amendments include CARB's near-term and mid-term standards, phased in from 2009 through 2012, and from 2013 through 2016 respectively.

The GHG vehicle standards apply to emissions from the following four sources:

- (1) Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions resulting directly from operation of the vehicle,
- (2) CO₂ emissions resulting from operating the air conditioning system (indirect AC emissions),
- (3) Refrigerant emissions from the air conditioning system due to either leakage, losses during recharging, sudden releases due to accidents, or release from scrappage of the vehicle at end of life (direct AC emissions), and
- (4) Upstream emissions associated with the production of the fuel used by the vehicle.

Table 1 below contains the proposed fleet average GHG standards, expressed in terms of CO₂ equivalent grams per mile, as well as the phase-in schedule for large volume manufacturers (small and intermediate volume manufacturers will have to comply with GHG requirements beginning with model year 2016 vehicles):

TABLE 1. CO₂ EQUIVALENT EMISSION STANDARDS FOR MODEL YEARS 2009 THROUGH 2016

Tier	Year	CO ₂ -equivalent emission standard by vehicle category (g/mi)	
		PC/LDT1	LDT2
Near-term	2009	323	439
	2010	301	420
	2011	267	390
	2012	233	361
Mid-term	2013	227	355
	2014	222	350
	2015	213	341
	2016	205	332

The standards were determined by CARB through a multi step process that involved the evaluation of technologies to reduce GHG emissions from exhaust and air conditioning systems, determination of baseline emissions, and ultimately the reductions to be achieved. The steps taken by CARB are summarized as follows⁹:

- 1) Appropriate technologies were selected from the Northeast States Center for a Clean Air Future (NESCCAF¹⁰) study for setting the near and mid-term standards.
- 2) Average CO₂ exhaust emission values were determined for each technology package.
- 3) The exhaust emission values were adjusted to reflect reductions due to improved mobile air conditioning systems (MACS), and include CH₄ and N₂O emissions.

⁹ CARB Initial Statement Of Reasons (ISOR), August 6, 2004, Page 105

¹⁰ NESCCAF, September 2004, Reducing Greenhouse Gas Emissions from Light Duty Motor Vehicles.

- 4) The CO₂ equivalent emissions were used to establish the regression lines to set near- and mid-term standards.
- 5) The baseline CO₂ equivalent emissions for California's MY 2002 new light duty vehicles were determined.
- 6) California's baseline data was used to establish the baseline CO₂ equivalent emissions for passenger car/light duty truck1 (PC/LDT1) and light duty truck2 (LDT2) classes for the manufacturer with the heaviest overall average vehicle weight (this ensures that the proposed reductions are feasible for all manufacturers).
- 7) The near and mid-term emission standards were derived for the subject vehicle classes.

The NESCCAF study noted above assessed the possible emissions reductions that would result from the application of various technologies, applied both individually and combined in packages. The study also considered those technologies that are expected to be in widespread use between 2009 and 2012 (near-term technologies), and those that are anticipated to be widely available between 2013 and 2016 (mid-term technologies). Some examples of near- and mid-term technologies are¹¹:

Near-term technologies:

- Cam phasing; dual cam phasing (DCP), coupled cam phasing (CCP)
- Variable valve lift; discrete (DVVL) and continuous (CVVL)
- Charge modification (turbo or super-charging)
- Cylinder deactivation
- Gasoline direct injection stoichiometric (GDI-S)
- Variable compression ratio (VCR)
- 6 speed transmissions; automatic, automated manual
- Continuously variable transmissions (CVT)
- Electrified accessories; power steering, etc.
- Aggressive transmission shift logic
- Variable displacement air conditioning compressor (VDC)

Mid-term technologies:

- Camless valve actuation (CVA); electromagnetic, electrohydraulic
- Gasoline direct injection lean burn (GDI-L)
- Gasoline homogeneous charge compression ignition (HCCI)
- Electric water pump
- 42 volt integrated starter generator (ISG)
- Diesel high speed direct injection (HSDI)

The NESCCAF study further assessed the application of these technologies with respect to five different classes of vehicles; small cars, larger cars, minivans, small trucks, and large trucks. Table 5.2-3 of CARB'S ISOR illustrates in detail the CO₂ equivalent reductions associated with the various technologies when applied to the different types of vehicles.

In order to evaluate the impact of direct and indirect emissions from mobile air conditioning systems (MACS), CARB developed a methodology to estimate such emissions and awarded credit for the application of technologies which reduce MACS emissions. Direct emissions consist of leakage of refrigerant directly from the system and can be reduced through the use of technologies like improved

¹¹ NY Department of Environmental Conservation Regulatory Impact Statement, Page 16, from CARB ISOR Page 59.

compressor shaft seals and improved hoses and fittings. Indirect emissions result from the load imposed on the engine due to the weight of and through the operation of the MACS and can be reduced by incorporating advanced MACS technology such as variable displacement compressors and temperature controls.¹² CARB has structured the regulations such that manufacturers applying these types of technologies to their MACS may apply credit towards their measured exhaust GHG emissions when demonstrating compliance with the standards.¹³

CARB estimates that 31% of the total CO₂ emissions associated with conventional gasoline-fueled vehicles result from upstream emissions resulting from fuel production.¹⁴ In order to account for the use of alternative fuels with higher or lower upstream CO₂ emissions, Table 6.4-1 of CARB's ISOR contains CO₂ adjustment factors for vehicles other than zero emission vehicles. For example, liquid propane gas production generates about 89% of the CO₂ of conventional reformulated gasoline production. These factors will be multiplied by the CO₂ exhaust emissions in order to determine the upstream benefit (or disbenefit) of alternative fueled vehicles when compared to conventionally fueled vehicles.¹⁵ Note that CARB's GHG standards for gasoline and diesel fueled vehicles do not directly reflect upstream emissions, but only the direct or "vehicle" emissions. This approach simplifies the regulatory treatment of gasoline vehicles, while at the same time allowing for appropriate treatment of alternative fuel vehicles.¹⁶

Massachusetts proposes to rely on CARB's evaluation and certification process with respect to determining the appropriate GHG standard to which a vehicle or test group is certified.

Early Reduction Credits

In developing the vehicle GHG emissions regulations, CARB was required by California law (Assembly Bill 1493) to grant emissions reduction credits for any GHG reductions achieved before the model year effective date of the regulation.

In keeping with this requirement, CARB proposed that:

- (1) Credit be awarded for early emission reductions for MY 2000 through 2008, with manufacturers allowed to opt in to the program during any model year during this timeframe; and
- (2) The fully-phased-in near-term emission standards (of MY 2012 as listed in Table 1) be the baseline against which manufacturer's fleet average emissions be compared for the model years beginning with their first year of participation through 2008 (i.e., 233 grams CO₂ equivalent per mile for PC/LDT1 and 361 grams per mile for LDT2).

The early credit provisions, as proposed, would compare a manufacturer's fleet average emissions to the standards noted in (2) above, and, if a manufacturer has fleet average emissions in a specific model year lower than these standards, the manufacturer would earn early compliance credits. Any early reduction credits earned could be used during MY 2009 through 2015, or traded to another manufacturer. To ensure that the regulation ultimately achieves the greatest possible climate change reductions, CARB proposed that the credits generated by early compliance retain full value through MY 2013. These credits

¹² CARB ISOR, Page 109

¹³ CARB ISOR, Page 107

¹⁴ CARB ISOR, Page 124

¹⁵ CARB ISOR, Page 125

¹⁶ CARB ISOR, Page 125

will then be worth 50 percent of their initial value in MY 2014, 25 percent of their initial value in MY 2015 and have no value thereafter.¹⁷

Massachusetts proposes to include in its regulations, early reduction credit provisions identical to those proposed in the CARB GHG rules.

Alternative Compliance Methods

AB 1493 also required that the regulations developed by CARB “provide flexibility, to the maximum extent feasible consistent with this section, in the means by which a person subject to the regulations ... may comply with the regulations. That flexibility shall include, but is not limited to, authorization for a person to use alternative methods of compliance with the regulations.” However, the use of alternative compliance strategies must not undercut the primary purpose of the regulation, which is to achieve GHG reductions from motor vehicles.

In keeping with AB 1493’s requirements, CARB proposed alternative compliance provisions that provide manufactures with compliance flexibility, but limit the alternative compliance options to only those manufacturers and their vehicles that are regulated through AB 1493 (for example, MY 2009 and later passenger vehicles and light-duty trucks). Further, CARB limits eligible projects to those that achieve GHG reductions through the documented increased use of alternative fuels in eligible vehicles. This ensures that the alternative compliance option does not dilute the technology-forcing nature of the regulation, since the goal is to reduce emissions from the regulated vehicles.¹⁸

Section 6.6 of CARB’s ISOR contains detailed information regarding the alternative compliance components proposed by CARB, including eligibility, criteria for awarding credit to alternative compliance projects, issuance and use of alternative compliance credits and recordkeeping, auditing and enforcement requirements.¹⁹

Massachusetts proposes to incorporate identical alternative methods of compliance requirements into its vehicle GHG emissions regulations as those proposed by CARB. However, only projects and vehicles in Massachusetts would be eligible for consideration under the alternative compliance provisions.

¹⁷ CARB ISOR, Page 129

¹⁸ CARB ISOR, Page 130

¹⁹ CARB ISOR, Page 130

V. REGULATORY DECLARATIONS

Section 177 of the Clean Air Act

The proposed adoption of CARB's GHG vehicle exhaust emission standards meet the provisions of Section 177 of the CAA, which require that the Massachusetts emissions standards be put in place two years before the model year to which they will apply. The Department is proposing the adoption of the GHG requirements in 2005 and they will not become effective until MY 2009, thus providing the two year lead time required by Section 177.

Section 177 of the CAA also mandates that if a state adopts the California motor vehicle emission standards, the standards must be "identical to the California standards" for which California received a waiver of preemption from implementing the federal motor vehicle emission standards from EPA. The proposed Massachusetts GHG vehicle exhaust emission standards directly cite and/or incorporate by reference the applicable sections within Title 13 of the CCR and they also include language from the "Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium Duty Vehicles," which can be found in Appendix C.

The Department is not proposing any standards or requirements which would create an undue burden on the manufacturers by either preventing the sale of a vehicle certified to California standards or by requiring the creation of a "third vehicle".

M.G.L. c. 111, Section 142K

The regulatory amendments meet the requirements of M.G.L. c. 111, Section 142K, which requires the Department to adopt and implement California motor vehicle emission standards

"unless, after a public hearing, the Department establishes, based on substantial evidence, that said emission standards and compliance program similar to the state of California's will not achieve, in the aggregate, greater motor vehicle pollution reductions than the federal standards and compliance program for any such model year."

The Department analyzed the emission benefits of the proposed GHG regulations.²⁰ Since there are no federal motor vehicle GHG emission standards, California's standards are clearly more stringent.

VI. AIR QUALITY IMPACTS

As mentioned above, the Department is required by M.G.L. c. 111, Section 142K, to compare the air quality impacts of adopting the California vehicle GHG emissions standards to the impacts of relying on federal standards in place in Massachusetts. However, there are no federal standards regulating vehicle GHG emissions with which to make such a comparison.

CARB's analysis of the proposed GHG standards established baseline vehicle GHG emissions that would result under the current LEV standards and compared the impact of the proposed GHG standards to those baseline emissions. CARB staff estimated that California baseline emissions were 386,600 CO₂ equivalent tons per day in 2004, would be 430,200 CO₂ equivalent tons per day in 2010, and would be nearly 600,000 CO₂ equivalent tons per day in 2030.²¹ Taking into account the penetration into

²⁰ NESCAUM Study on GHG reductions, modified for Massachusetts' 5% tax rate

²¹ CARB ISOR, Pages vii, viii

the California fleet of 2009 and later vehicles meeting the new standards, CARB staff estimated that the proposed regulation will reduce GHG emissions by an estimated 87,400 CO₂ equivalent tons per day statewide in 2020 and by 154,500 CO₂ equivalent tons per day in 2030. This translates into an 18 percent overall reduction in GHG emissions from the light duty fleet in 2020 and a 27 percent overall reduction in 2030.²²

In an effort to determine the potential reduction of GHG emission in Massachusetts of the proposed standards, the Department utilized an assessment performed by Northeast States for Coordinated Air Use Management (NESCAUM).²³ The results of this analysis showed that adoption of the CARB vehicle GHG emissions standards would result in a reduction in CO₂ equivalent emissions in Massachusetts. A copy of the full technical analysis is available through the Department.

Table 2 below illustrates the benefits of the proposed California vehicle GHG emission standards in Massachusetts, as determined by the NESCAUM analysis.

TABLE 2. MASSACHUSETTS BENEFITS DUE TO ADOPTION OF CALIFORNIA GHG STANDARDS

Model Year	Million tons CO ₂ -equivalent			Percent Reduced
	Baseline (without controls)	With Controls	Reduction	
2020	27.67	22.57	5.10	-18%
2030	28.77	21.90	6.87	-24%
2040	30.00	22.75	7.25	-24%
2050	31.29	23.72	7.56	-24%

These baseline and resultant emission estimates are for the vehicles which would be affected by this regulation (i.e., light duty vehicles and light duty trucks). The results of the CO₂-equivalent emission reductions in Massachusetts include tailpipe CO₂ emissions, incremental tailpipe CO₂ due to A/C usage (weighted by the fraction of VMT accumulated with A/C on), tailpipe CH₄ times the CH₄ Global Warming Potential (GWP), tailpipe N₂O times the N₂O GWP, and A/C refrigerant hydrofluorocarbon (HFC) leakage times the HFC GWP. It should be noted that the estimated reductions exclude potential “upstream” emission reductions associated with reduced petroleum processing, etc.

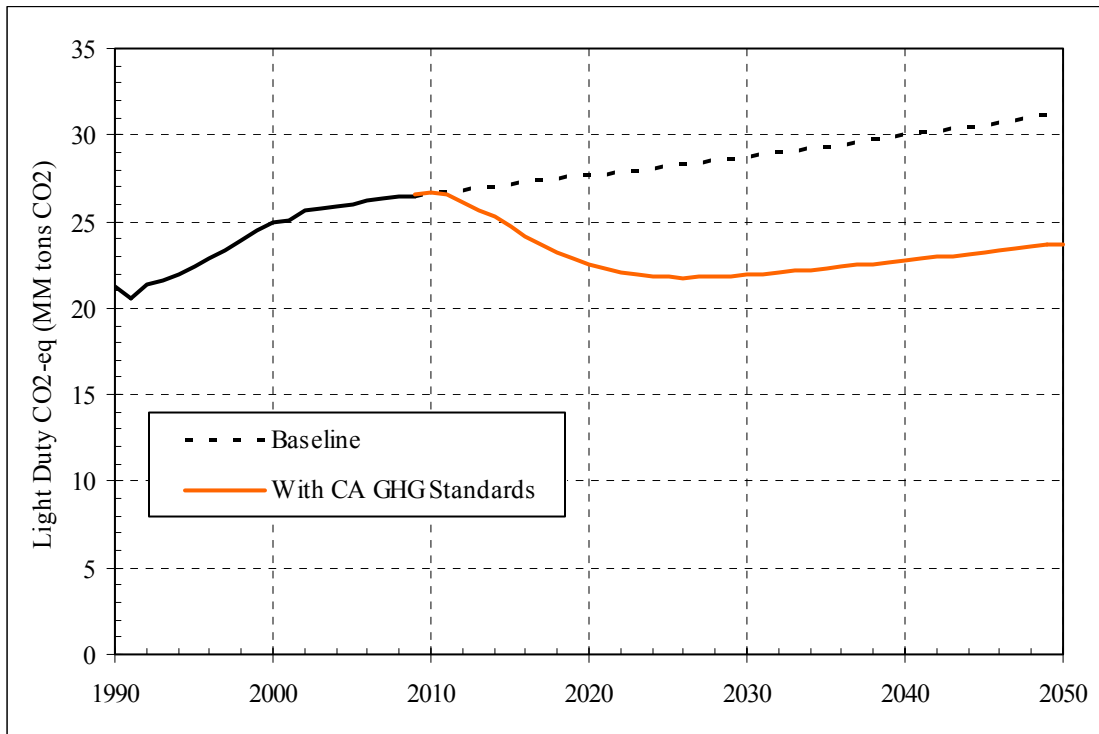
The resultant emission estimates also assume that vehicle manufacturers will introduce high efficiency, low leakage air conditioning systems across the light duty vehicle fleet in response to the GHG standards, as such changes are very cost effective relative to other technology responses.

The benefits of adopting the proposed GHG standards can further be seen in Table 3 on the following page, which demonstrates graphically the potential benefits if the California vehicle GHG emission standards are adopted in Massachusetts.

²² CARB ISOR, Page vii

²³ NESCAUM Study on GHG reductions, modified for Massachusetts’ 5% tax rate

TABLE 3. COMPARISON OF CO₂ EMISSIONS IN MASSACHUSETTS



Adoption of the CA GHG standards by Massachusetts, as well as other states, will not only lead to beneficial reductions in GHGs in Massachusetts, but will continue to drive the development of advanced technology vehicles, bringing to market cleaner vehicles not just in Massachusetts, but throughout the entire country.

VII. ECONOMIC IMPACTS

The Department reviewed the results of CARB's analysis with respect to the estimated costs associated with adopting the proposed GHG standards. The Department further assessed NESCAUM's study, which included an analysis of the cost which would result from adopting CA's GHG emission standards.

The results of CARB's extensive analysis showed that the average fleetwide incremental cost of control by vehicle type to meet the proposed standards through 2006, taking into account the phase-in of the standard and the specific starting point of the six largest individual manufacturers, will be as follows:²⁴

²⁴ Control costs from revised Table 6.2-8, Addendum to CARB ISOR, Sep. 2004

TABLE 4. AVERAGE INCREMENTAL VEHICLE COST OF CONTROL BY MODEL YEAR FOR THE MAJOR SIX AUTOMAKERS

Year	Phase-in stage	Vehicle Size	All Six Major Manufacturers*
2009	Near Term Phase-in	PC/ LDT1	\$17
		LDT2	\$36
2010		PC/ LDT1	\$58
		LDT2	\$85
2011		PC/ LDT1	\$230
		LDT2	\$176
2012		PC/ LDT1	\$367
		LDT2	\$277
2013	Mid term Phase-in	PC/ LDT1	\$504
		LDT2	\$434
2014		PC/ LDT1	\$609
		LDT2	\$581
2015		PC/ LDT1	\$836
		LDT2	\$804
2016		PC/ LDT1	\$1,064
		LDT2	\$1,029

* Major six automakers (GM, Ford, DaimlerChrysler, Toyota, Honda, Nissan).

As illustrated in Table 4 above, the fully phased in the near term standards will result in an estimated average cost increase of \$367 for PC/LDT1, and \$277 for LDT2 over the 2009 baseline vehicle. Also, the fully phased in mid term standards will result in an estimated average cost increase of \$1,064 for PC/LDT1 and \$1,029 for LDT2. AB1493 required that the regulation be economical to the consumer over the life cycle of the vehicle. In keeping with that requirement, CARB has shown that the technology packages that provide the basis for the standards result in operating cost savings over the lifetime of the vehicle and the incremental cost increases will be more than offset by those savings.²⁵ CARB estimated that the average cost-effectiveness of the proposed regulation would be \$126 dollars per ton of CO₂ reduced in 2020, and \$120 in 2030.²⁶

The Department does not anticipate any difference in the incremental vehicle costs for vehicles placed in Massachusetts compared to those placed in California. As with the existing LEV requirements, the vehicles required for sale in Massachusetts will be the same vehicles available in California.

In order to determine the cost effectiveness of the proposed standards to consumers in Massachusetts, the Department again relied on NESCAUM's GHG benefit analysis. As in the CARB analysis, the NESCAUM analysis also demonstrated that the increased vehicle costs associated with inclusion of GHG-reducing technologies would be more than offset by savings in operating cost. Table 5 below provides an example of the cost savings on a per month basis over the course of a five year loan for PC/LDT1 and LDT2, using the 5% Massachusetts sales tax rate. In this case, the weighted use of air conditioning is factored in to the calculation by NESCAUM.²⁷

²⁵ CARB ISOR, page 148

²⁶ Addendum to CARB ISOR, Sep. 2004

²⁷ NESCAUM Study on GHG reductions, modified for Massachusetts' 5% tax rate

TABLE 5. COST SAVINGS FOR PC/LDT AND LDT2, FIVE YEAR LOAN

	Near-Term PC/LDT1	Near-Term LDT2	Mid-Term PC/LDT1	Mid-Term LDT2
Saved Dollars per Ton of CO ₂ Reduced	\$166	\$197	\$128	\$150
Average Monthly Savings During Assumed 5-Year Loan Period	\$24.95	\$27.58	\$13.44	\$15.15

This is but one example from the NESCAUM analysis which supports the results of CARB's analysis; there is a net savings for consumers with the adoption of the vehicle GHG emission standards.

VIII. OTHER PROGRAM IMPACTS

Massachusetts Municipalities & Proposition 2½

Municipal facilities will not be affected by the proposed changes to 310 CMR 7.40. The LEV Program is primarily directed toward vehicle and engine manufacturers. The only impact on municipalities will be when purchasing vehicles.

Massachusetts Environmental Policy Act

The amended LEV regulation is "categorically exempt" from the Massachusetts Environmental Policy Act (MEPA) regulations, 301 CMR 11.00, because the regulation will result in reduced emission levels. All reasonable measures have been taken to minimize adverse impacts.

Agricultural Impacts

M.G.L., c. 30A, Section 18, requires state agencies to evaluate the impact of programs on agriculture within the Commonwealth. The Department has determined that the regulation will not adversely impact agriculture in Massachusetts. The only impact on agriculture will be beneficial, as the program will help reduce greenhouse gas emissions and begin to reduce the potential for harmful changes to the climate. Such changes may include more frequent severe weather events, higher average temperatures which lead to drier conditions and droughts, as well as other impacts to agriculture. Notably, the GHG standards do not apply to farm machinery and include exceptions for larger trucks typically used in agriculture.

IX. PUBLIC PARTICIPATION

As required by M.G.L. c. 111, Section 142K and M.G.L. c. 30A the Department gives notice and provides the opportunity to review background and technical information at least 21 days prior to proposing the regulation amendments at a public hearing. To assure more adequate notice for processing a rule as an amendment to the SIP, formal notice will be issued 30 days before the public hearing. The hearing will be held in Boston.